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Evaluation of Douglas-fir Beetle (Coleoptera:Scolytidae) in the Black Pine Division, Sawtooth National Forest, Idaho

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ABSTRACT

An evaluation of the Douglas-fir beetle (*Dendroctonus pseudotsugae* Hopkins) situation on the Black Pine Division, Burley Ranger District, Sawtooth National Forest was undertaken in 1994. Douglas-fir was the only conifer species recorded on the survey plots with most trees in the <12" diameter class. Beetle-caused tree mortality ranged from 11.5 to 43.3 trees per acre. Drought was probably the underlying reason for this infestation.

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INTRODUCTION

The Black Pine Division is located on the Burley Ranger District, Sawtooth National Forest, approximately 50 miles southeast of Burley, Idaho. The Division is an isolated mountain range surrounded by agricultual lands. It is approximately 76,000 acres in size and ranges in elevation from 6,000 ft. to 9,400 ft..

Various abiotic events have influenced the forest in the Black Pine Division. Drought was recognized across southern Idaho beginning about 1985 (Forest Pest Management 1985, Knapp et al. 1988, 1989) through the early 1990's; hence, trees' competition for moisture was intense. Bark beetle populations had also probably grown as a result of the drought (Mattson and Haack 1987). Annual aerial detection surveys noted high levels of Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) mortality in this infestation since 1989 through 1995.

This report documents the evaluation of the Douglas-fir beetle situation and projects further activity.

METHODS

The evaluation was based on permanent, one-acre strip plots (1 ch X 10 ch) and 20 BAF variable plots placed along arbitrarily selected survey lines. Survey lines were planned and marked on maps and aerial photos. One variable plot was randomly established along the survey line in each strip plot.

In each strip plot, all Douglas-fir trees $\geq$ 5" in diameter at 4.5' (d.b.h.) were examined for evidence of bark beetle attack. Species, d.b.h., and year of attack were recorded for those trees attacked. The strip plot data were used to characterize the infestation.

Variable plot data were used to characterize the stand. Species, d.b.h., and condition of all trees $\geq$ 5" d.b.h. on the variable plots were recorded.

Following the field survey, data were summarized by survey area. The average number of trees per acre was computed and displayed by diameter and year of beetle attack. General stand characteristics were computed from the variable plot data using INDIDS (Bousfield et al. 1985). By comparing data from the strip and variable plots, the uninfested component and percent infestation were determined.

RESULTS

In early June 1994, a 3 or 4 person crew established 9 strip and accompanying variable plots in three areas in the Black Pine Division. Two plots were installed in Sixmile Canyon, three in Pole Canyon, and four in East Dry Canyon (Fig. 1).

We found Douglas-fir to be the only conifer species present on our plots. Trees under 12" d.b.h. were most abundant with as few as an average of 170.5 trees/acre in Pole Canyon to 392.5 trees/acre in Sixmile Canyon. The Douglas-fir >12" d.b.h. were least abundant in Pole Canyon with an average of only 39.4 trees/acre and most abundant in Sixmile Canyon with 139.2 trees/acre (Table 1).

Total tree mortality caused by Douglas-fir beetle ranged from 43.3 trees/acre in Pole Canyon to 11.5 trees/acre in East Dry Canyon (Table 2). Most activity occurred in 1993 and earlier. We compared the number of infested trees to the number of uninfested trees. Percent of Douglas-fir trees infested ranged from 3.5% in East Dry Canyon to 17.1% in Pole Canyon (Table 2).

The mean diameter of trees killed ranged from 12.9" d.b.h. in Sixmile Canyon to 15.8" d.b.h. in East Dry Canyon. The mean diameter of infested trees exceeded the mean diameter of uninfested trees in all areas in all years (Table 3).

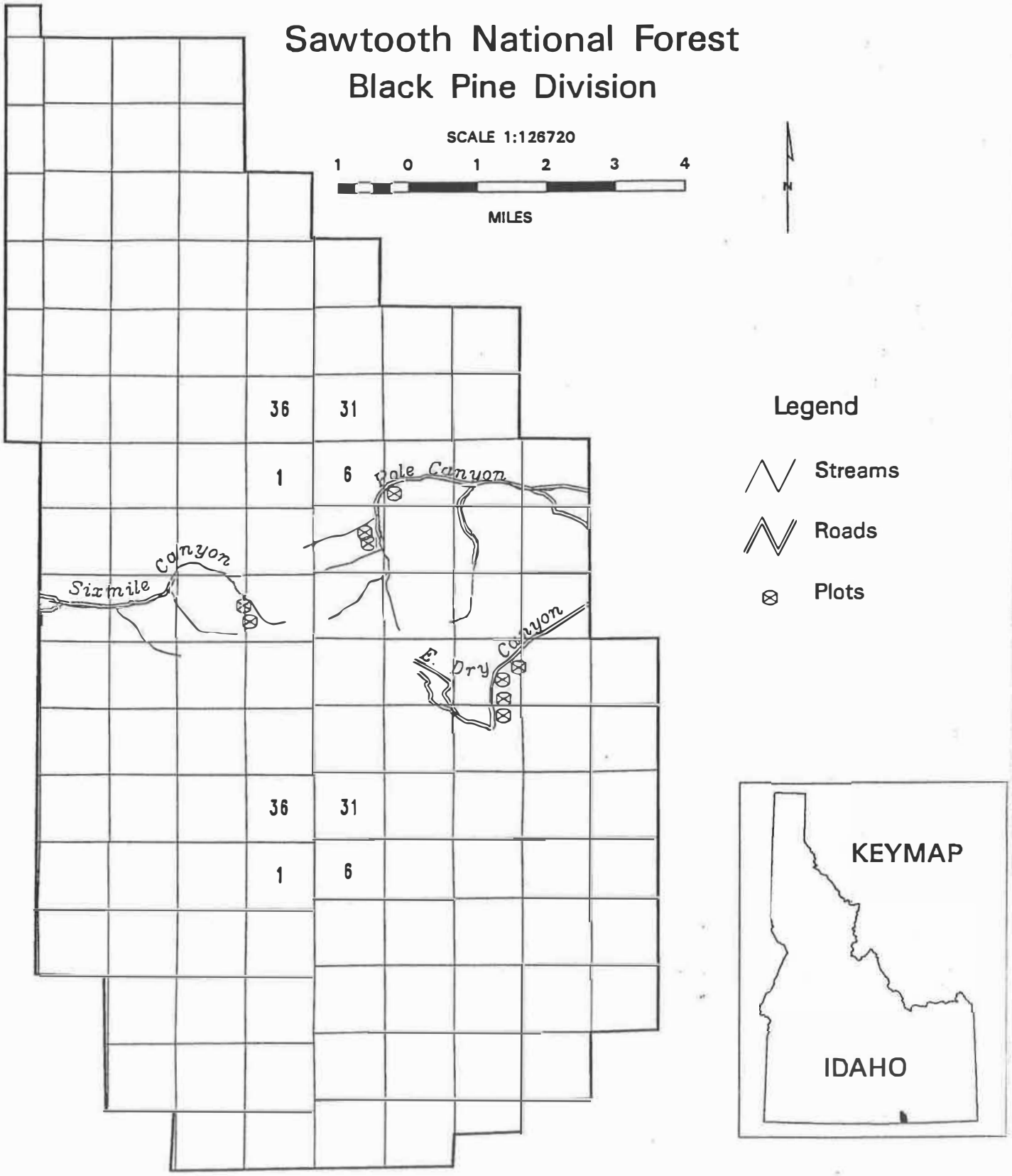

Figure 1. Plot locations - Black Pine Division.

Table 1. Stand composition, live Douglas-fir trees - Black Pine Division

Survey Area	Live Douglas-fir trees/acre by diameter class (inches DBH)		
	5-8.9"	9-11.9"	12"+
East Dry Canyon	56.1	135.4	123.1
Pole Canyon	99.8	70.7	39.4
Sixmile Canyon	215.7	176.8	139.2

Table 2. Mean (S.D.) number of infested Douglas-fir trees ≥ 5" d.b.h. per acre - Black Pine Division.

Survey Area	infested			Total infested	uninfested[2]
(number of plots)	1994	1993	older[1]		
East Dry Canyon (4)	3.5 (4.04)	7.3 (10.87)	0.5 (1.00)	11.5 (14.80)	315.7
Pole Canyon (3)	0.3 (0.58)	20.7 (31.47)	22.7 (17.50)	43.3 (18.56)	209.9
Sixmile Canyon (2)	0	4.5 (2.12)	25.5 (13.44)	30.5 (12.02)	531.7

[1] prior to 1993.
[2] value calculated by INDIDS.

Table 3. Mean (S.D.) diameter (inches d.b.h.) Douglas-fir trees ≥ 5" d.b.h. - Black Pine Division.

Survey Area	infested			Total infested	uninfested
(number of plots)	1994	1993	older[1]		
East Dry Canyon (4)	15.0 (3.44)	16.1 (5.03)	15.7 (7.37)	15.8 (4.67)	13.5 (4.33)
Pole Canyon (3)	26.0 (0)	13.7 (3.57)	15.2 (5.84)	14.6 (5.01	10.4 (3.29
Sixmile Canyon (2)	0	10.0 (2.29)	13.3 (4.33)	12.9 (4.25)	11.1 (4.83)

[1] prior to 1993.

DISCUSSION

The beetle activity in the Black Pine Division indicated conditions existed to support the infestation. Factors such as drought, tree species composition, tree diameter and tree density all probably supported beetle activity.

These data allow speculation regarding the future of the infestations. Speculation is based on generalities from experience and observations which indicate that a certain size tree, based on diameter, and species composition are conducive to beetle activity. These are nothing more than generalities. Other factors, like abiotic environment such as weather, and the biotic environment, such as the predator and parasite complex, certainly influence beetle activity.

The intensity of the infestation has slowed in all areas. Fewer trees were infested in all areas in 1994 and, according to aerial detection survey records, the trend continued in 1995 and 1996 with fewer than 700 trees killed. Activity was still concentrated in East Dry, Pole and Sixmile Creek canyons. In all areas the average diameter of infested Douglas-firs in 1994 exceeded the average diameter of uninfested Douglas-fir. Since Douglas-fir beetle generally attacks the larger trees (Furniss 1962), larger diameter trees may be killed as the infestation declines.

Stand composition is worthy of comment. Since Douglas-fir dominates the Black Pine Division, Douglas-fir beetle may be operating to regulate stand density by infesting trees under competitive strees. This is in contrast to those situations where the beetle is an agent removing diseased or decadent host trees. If this is true we may observe mortality, especially when drought stressed, in trees of smaller diameter than what we accept as normal beetle behavior.

In conclusion, one can expect bark beetles to cause change in the system. Beetle populations will increase and then decline as their preferred host trees are depleted or abiotic weather conditions change.

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